

SD0716: E-FAD, Electric Field Activation Detector



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EFAD: Electrical Field Activation Detector

Parts Included:

Sensor:

- Large Pole-Mount Enclosure
- External Sensing Antenna
- External Transceiver Antenna
- AA Batteries x2
- Enclosure Screws x4

Handheld:

- Handheld Enclosure with LCD
- External Transceiver Antenna
- AA Batteries x2

Substation Receiver:

- XBee Series 2 RS-232 and/or USB interface board(s)
- XBee Series 2 RF-module, pre-configured with firmware “COORDINATOR API” version 1141
- AC adaptor
- RS-232 cable

Mounting Instructions and Setup:

The Pole-Mount Sensor needs to be mounted within 42” or 3.5’ of 7.2 kV or 12.5 kV high voltage distribution line for best results.

WARNING: This needs to be installed while line is de-energized by power cooperative personal. DO NOT attempt to install this by climbing a power pole.

1. Install AA batteries into battery housing. Attach external transceiver antenna to male RPS adapter.
2. Using included mounting harness and screws, secure the sensor box to the pole within 42” of distribution line, abiding by cooperative distance-to-line limitations.

Handheld Instructions:

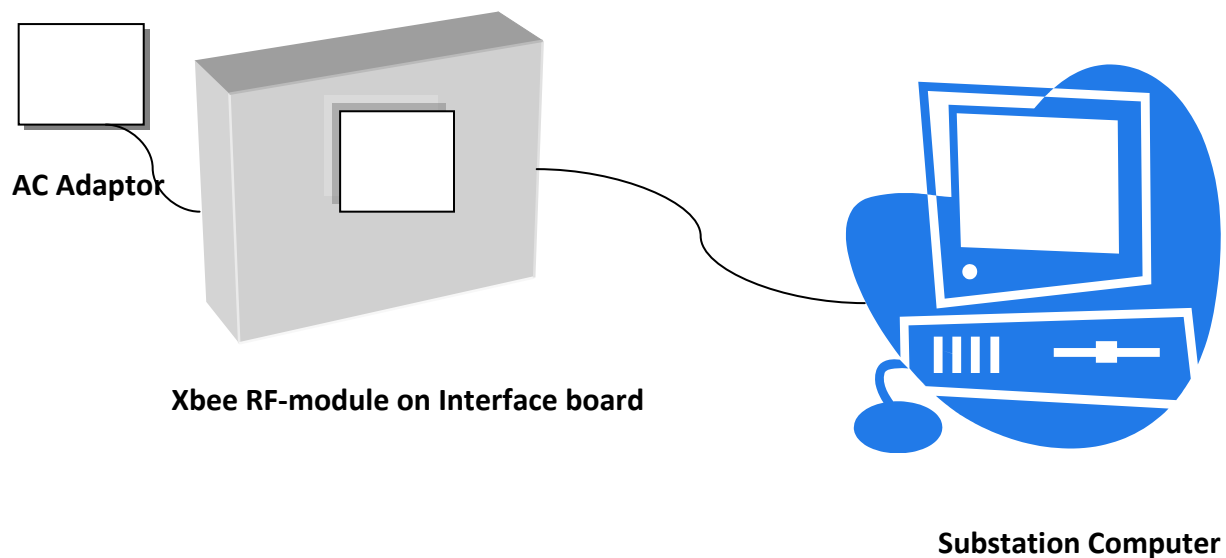
The handheld device and LCD display are used to wirelessly display information regarding the distribution line.

1. Install AA batteries into battery housing. Attach external transceiver antenna to male RPS adapter.
2. Once the sensor has been successfully installed on a power pole, and turned "ON" the handheld will receive signal regarding the status of the line.
3. The LCD will display the voltage sensed on the sensor from the electric field NOT the voltage on the line.
4. Now you need to calibrate the sensed voltage reading with the Energized and non-Energized conditions of the line.

The following readings are taken from the test with an 110V Open circuit line.

Distance (between the sensor and the line)	Voltage reading when line Energized	Voltage reading when line not Energized
1inch	520 mV	130 mV
1.5inch	440 mV	132 mV
2inch	310 mV	129 mV
2.5inch	250 mV	132 mV
3 inch	160 mV	130 mV

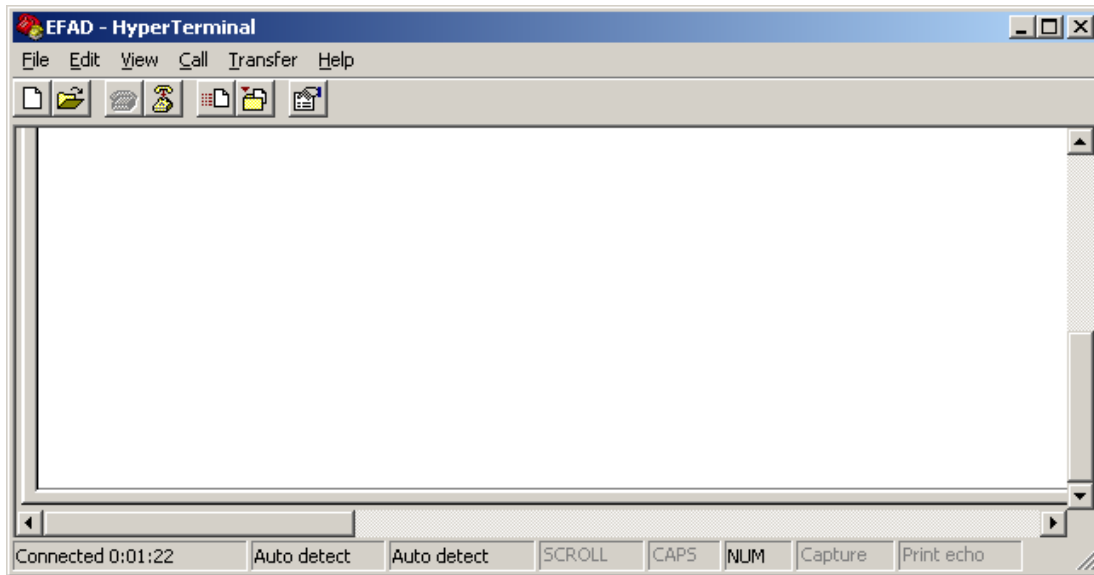
You can calibrate the threshold voltage, considering these readings to be your reference.

Substation Computer Instructions:

1. Before powering the interface board, make sure that the RS232 cable is properly connected at the Interface board and the COM port of the computer.
2. Power the interface board
3. Open Hyper Terminal, on the substation computer.

To access Hyper Terminal, follow the Start Button:

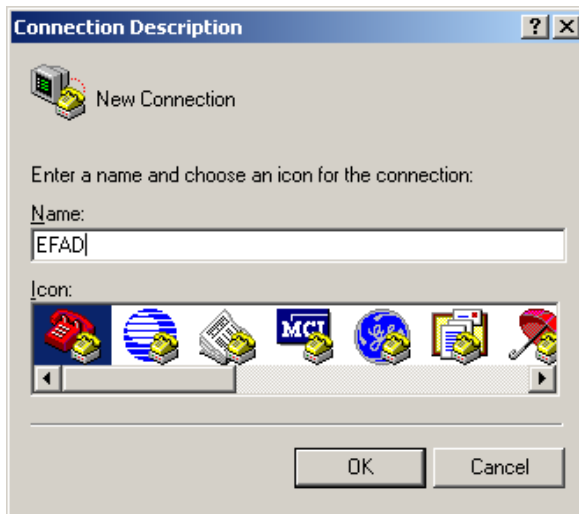
Start/Programs/Accessories/Communications/HyperTerminal/Hypertrm.exe



In the Connection Description wizard:

Enter a Name: EFAD

Click 'OK'



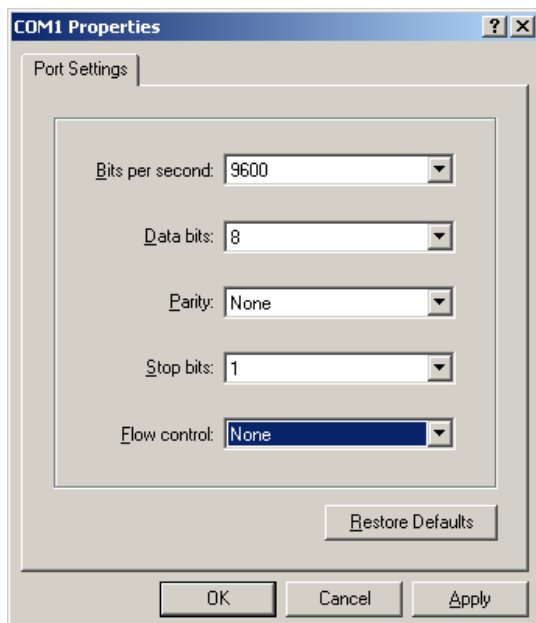
Connect Using: COM1

(Assuming that the serial port used is COM1. Check with your PC manual for settings for serial port). Click 'OK'



Accept the parameters as listed below:

- Bits per sec = 9600
- Data bits = 8
- Parity = none
- Stop bits = 1
- Flow control = None



Troubleshooting:

LCD does not display anything:

- Press the RESET button
- Is the device on?
- Check the batteries

LCD does not display readings:

- Make sure that you are within the coverage area of the transmitter
- Press the RESET button
- RESTART the device
- If it still does not display the readings, check for the batteries on the SENSOR unit

No data is received at the substation:

- Is the receiver powered?
- Is it receiving data (check for the pulsating GREEN lights)
- Is the receiver connected to the computer?
- Is the baud rate of the COM port set to 9600?
- If you are using Hyper Terminal, make sure that it is in CALL mode
- Make sure that the RF-Module perfectly sits in the interface board
- Is still it does not work, try restarting the entire system
- Check with the computer manual for the COM port & Hyper Terminal setting
- If it still does not display the readings, check for the batteries on the SENSOR unit

For technical information contact one of the personnel below:

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X-BEE RF-MODULES

Key Features:

- Long range data integrity, 100-300ft
- Low Power, 45mA(TX), 50mA(RX), 10uA(Sleep mode)
- Advanced Networking & Security, Unicast & Broadcast communications, Point-to-Point, Point-to-multipoint and peer-to-peer topologies supported
- ADC and I/O line support
- Easy Configuration
- Antenna options
- Worldwide Acceptance, FCC Approval (USA)
- Free & Unlimited Support



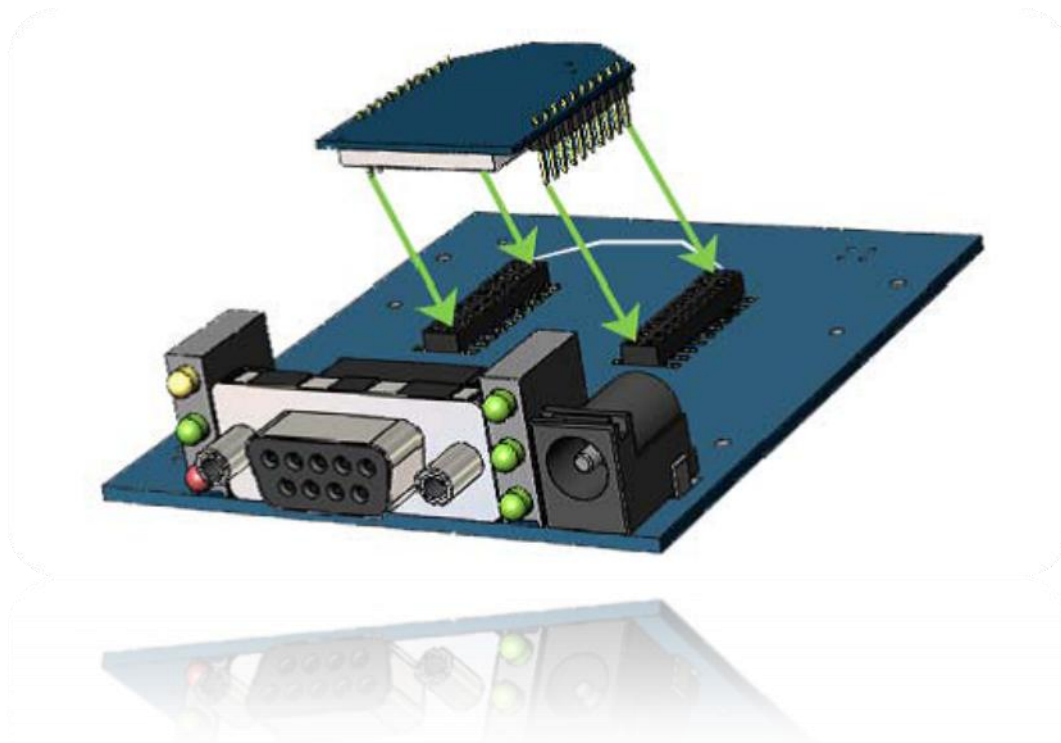
Specifications:

Specification	XBee Series 2
Performance	
Indoor/Urban Range	up to 133 ft. (40 m)
Outdoor RF line-of-sight Range	up to 400 ft. (120 m)
Transmit Power Output (software selectable)	2mW (+3dBm)
RF Data Rate	250,000 bps
Serial Interface Data Rate (software selectable)	1200 - 230400 bps (non-standard baud rates also supported)
Receiver Sensitivity	-95 dBm (1% packet error rate)
Power Requirements	
Supply Voltage	2.8 – 3.4 V
Operating Current (Transmit)	40mA (@ 3.3 V)
Operating Current (Receive)	40mA (@ 3.3 V)
Power-down Current	< 1 uA @ 25°C
General	
Operating Frequency Band	ISM 2.4 GHz
Dimensions	0.960" x 1.087" (2.438cm x 2.761cm)
Operating Temperature	-40 to 85° C (industrial)
Antenna Options	Integrated Whip, Chip, RPSMA, or U.FL Connector
Networking & Security	
Supported Network Topologies	Point-to-point, Point-to-multipoint, Peer-to-peer & Mesh
Number of Channels (software selectable)	16 Direct Sequence Channels
Addressing Options	PAN ID and Addresses, Cluster IDs and Endpoints (optional)
Agency Approvals	
United States (FCC Part 15.247)	Pending
Industry Canada (IC)	Pending
Europe (CE)	Pending

Antenna Options: The ranges specified are typical when using the integrated Whip (1.5 dBi) and Dipole (2.1 dBi) antennas. The Chip antenna option provides advantages in its form factor; however, it typically yields shorter range than the Whip and Dipole antenna options when transmitting outdoors. For more information, refer to the “XBee Series 2 Antenna” application note located on MaxStream’s web site

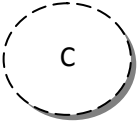
<http://www.maxstream.net/support/knowledgebase/article.php?kb=153>

Interface Board:

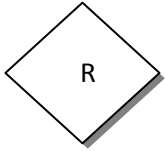


XBee Series 2 Module Mounting to an RS-232 Interface Board

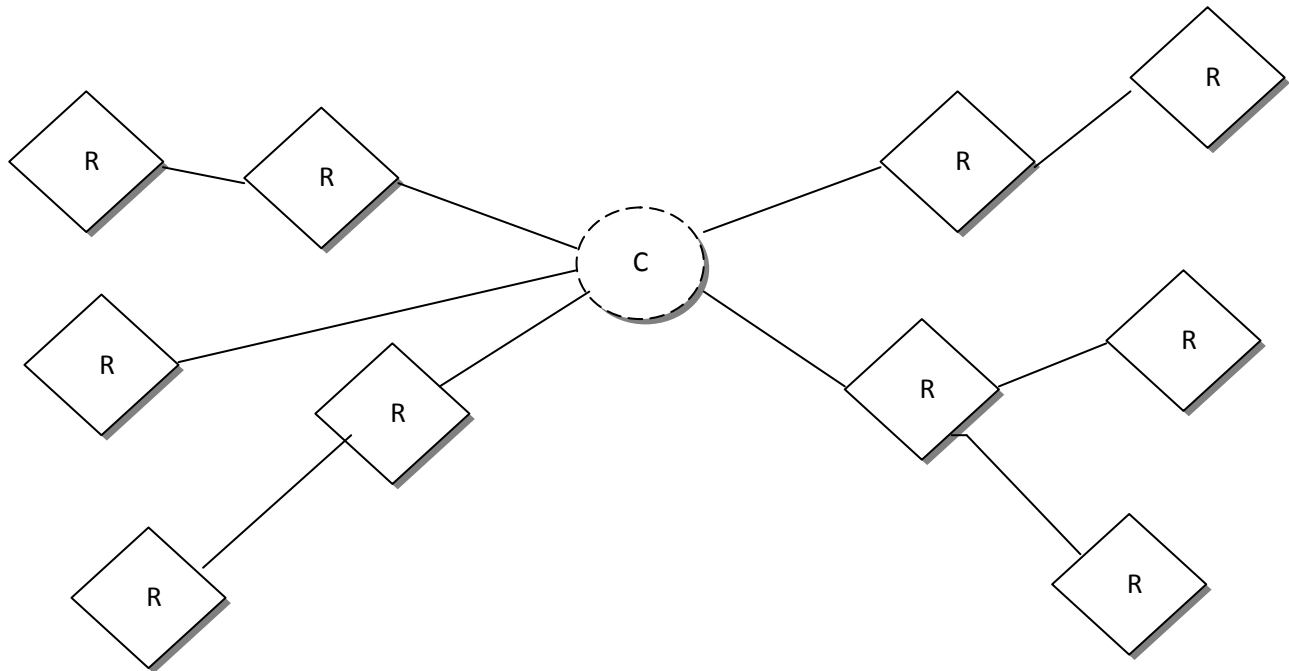
The XBee Series 2 Development Kits contain RS-232 and USB interface boards which use two 20-pin receptacles to receive modules. These are to be used for configuring the RF-modules.

Configurations:**Coordinator:**

One per PAN (network),
Organizes and manages a PAN

**Router:**

Many in numbers,
Responds to the Coordinator



Typical Configuration

Router: transceiver that is attached to the sensing device

FIRMWARE: ZNET 2.5 Router/End Device API version 1241

PAN ID	716
NI	ROUTER1
DH	0
DL	FFFF
SH	13A200
SL	XXX-XXX-XX
D1	2
IR	1388

D1=2 this is the ADC input setting. By setting IR=1388, we have set a sample rate of 5 seconds. The module will sample the D1 pin every 5 seconds and create and send an API frame. The DH and DL commands determine the destination address of the IO samples. Here the DH and DL are set to broadcast.

Coordinator: transceiver that is attached to the substation computer or handheld

FIRMWARE: ZNET 2.5 COORDINATOR API version 1141

PAN ID	716
NI	COORDINATOR1
DH	0
DL	FFFF
SH	13A200
SL	XXX-XXX-XX

NOTE: only devices running API firmware can send IO data samples out their UART. Devices running AT firmware will discard received IO data samples. This is the reason the coordinator is loaded with API firmware.

NOTE: Analog samples are returned as 10-bit values. The analog reading is scaled such that 0x0000 represents 0V, and 0x3FF = 1.2V. (The analog inputs on the module cannot read more than 1.2V.) Values for the "Output Volts" column are derived by converting the Hex values back to Volts using the following formula. Output Volts= (Hex Output/0x3FF)*1.2V (rounded to 2 decimal points).

THE API FRAME

Below is an example of an API frame sent out the receiving modules UART

7E 00 12 92 00 13 A2 00 40 0A 3D BF 66 BA 01 01 00 00 02 03 FF 4C

Where the UART API data stream can be broken down as:

7E	Start Delimiter
00 12	Length Bytes
92	API Identifier Value
00 13 A2 00 40 0A 3D BF	64-bit Address
66 BA	16-bit Address
01	Receive Options
01	Number of sample sets included in the payload
00 00	Digital Channel Mask
02	Bitmask field that indicates which digital IO lines on the remote have sampling enabled
03 FF	2 byte value indicating the A/D measurement of input
4C	Checksum